task_5.4.2_with_calc

Student Group

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Task 5.4.2 electrical Field at different Geometry I (exam task, ca 6% of a 60 minute exam)

The figure on the right shows an arrangement of ideal metallic conductors (gray) with specified charge. In white a dielectric (e.g. vacuum) is shown. Several designated areas are shown by green dashed frames, which are partly inside the objects.

Arrange the designated areas clearly according to ascending field strength (magnitude)! Indicate also, if designated areas have quantitatively the same field strength.

Tips for the solution

- What is the field in a room completely surrounded by a conductive conductor?
- How does the field behave inside a conductor?
- Does the field strength increase or decrease when a charge moves away from another charge?
- Is the field at a peak higher or lower?

Solution

1. At b and d no field is measurable, because the surrounded conductor is on a constant field. There is no potential difference and therefore no field.
2. At c a field (magnitude >0) is measurable, which points from the charge ($+1~\rm{C}$) to the elongated conductor ($-2~\rm{C}$). Due to the tip, there is an excess charge and thus a higher field.
3. At a a field (magnitude >0) is measurable, which points from the charge ($+1~\rm{C}$) to the elongated conductor ($-2~\rm{C}$).

Result

$ b = d < a < c $